

LISTING OF CLAIMS

The listing of claims below will replace all prior versions and listings of claims in the present application.

Claim Listing

- 1 1. (Original) A method comprising:
2 receiving a request to load a device policy module into a memory, wherein the
3 device policy module is for use by a device driver, and wherein the device
4 policy module includes at least one of a function, a procedure, and an
5 object-oriented method operable to perform at least one of input/output
6 (I/O) operation scheduling, path selection, and I/O operation error
7 analysis;
8 loading the device policy module into the memory; and
9 informing the device driver of availability of the device policy module.

- 1 2. (Original) The method of claim 1 wherein the request to load a device policy
2 module into a memory is received from at least one of a user application and a device
3 discovery application.

- 1 3. (Original) The method of claim 1 wherein a portion of the memory comprises
2 a kernel memory space, and wherein the loading the device policy module into the
3 memory further comprises:
4 loading the device policy module into the kernel memory space.

- 1 4. (Original) The method of claim 1 wherein the informing the device driver of
2 availability of the device policy module further comprises:
3 registering the device policy module with the device driver by calling at least one
4 of a function, a procedure, and an object-oriented method associated with
5 the device driver.

1 5. (Original) The method of claim 1 further comprising:
2 determining whether the device policy module is currently present in the memory.

1 6. (Original) The method of claim 1 further comprising:
2 informing the device driver of unavailability of the device policy module.

1 7. (Original) The method of claim 6 wherein the informing the device driver of
2 unavailability of the device policy module further comprises:
3 unregistering the device policy module with the device driver by calling at least
4 one of a function, a procedure, and an object-oriented method associated
5 with the device driver.

1 8. (Original) The method of claim 1 wherein the device policy module is for use
2 with a corresponding storage device, the method further comprising:
3 transmitting at least one storage device attribute to the device driver.

1 9. (Original) The method of claim 1 wherein the at least one of a function, a
2 procedure, and an object-oriented method of the device policy module is specific to a
3 particular storage device.

1 10. (Original) The method of claim 1 wherein the at least one of a function, a
2 procedure, and an object-oriented method operable to perform at least one of I/O
3 operation scheduling, path selection, and I/O operation error analysis performs at least
4 one of:
5 selecting one of a plurality of communication pathways to at least one storage
6 device;
7 selecting one or more sub-devices of the at least one storage device which will be
8 affected due to a communication pathway failure;
9 selecting an alternate communication pathway in case of a failure of one of the
10 plurality of communication pathways;

11 changing a current communications pathway from a first one of the plurality of
12 communication pathways to a second one of the plurality of
13 communication pathways;
14 responding to SCSI reservation/release requests; and
15 selectively transmitting I/O operations along at least two of the plurality of
16 communication pathways to the at least one storage device.

1 11. (Original) The method of claim 1 further comprising:
2 monitoring operation of the device policy module.

1 12. (Original) The method of claim 1 further comprising:
2 discovering the presence of at least one storage device belonging to a distributed
3 computing system.

1 13. (Original) The method of claim 12 further comprising:
2 determining whether the at least one storage device has a corresponding device
3 policy module.

1 14. (Original) A system comprising:
2 a storage device discovery module configured to determine information about at
3 least one storage device belonging to a distributed computing system; and
4 a multipath driver in communication with the storage device discovery module
5 and configured to direct input/output (I/O) operations along at least one of
6 a plurality of communication pathways to the at least one storage device,
7 the multipath driver including:
8 an interface configured to communicate with a device policy module
9 including at least one of a function, a procedure, and an object-
10 oriented method operable to perform at least one of I/O operation
11 scheduling, path selection, and I/O operation error analysis.

1 15. (Original) The system of claim 14 further comprising:
2 a device policy module including at least one of a function, a procedure, and an
3 object-oriented method operable to perform at least one of I/O operation
4 scheduling, path selection, and I/O operation error analysis.

1 16. (Original) The system of claim 15 wherein the at least one of a function, a
2 procedure, and an object-oriented method of the device policy module is specific to a
3 particular storage device.

1 17. (Original) The system of claim 14 wherein the at least one of a function, a
2 procedure, and an object-oriented method operable to perform at least one of I/O
3 operation scheduling, path selection, and I/O operation error analysis performs at least
4 one of:
5 select one of the plurality of communication pathways to the at least one storage
6 device;
7 select one or more sub-devices of the at least one storage device which will be
8 affected due to a communication pathway failure;
9 select an alternate communication pathway in case of a failure of one of the
10 plurality of communication pathways;
11 effect a communications pathway changeover;
12 respond to respond to SCSI reservation/release requests; and
13 selectively transmit I/O operations along at least two of the plurality of
14 communication pathways to the at least one storage device.

1 18. (Original) The system of claim 17 wherein the at least one storage device is a
2 disk array and wherein the one or more sub-devices are disk drives.

1 19. (Original) The system of claim 14 further comprising:
2 a memory; and

3 a processor coupled to the memory, wherein at least one of the storage device
4 discovery module and multipath driver are encoded as instructions stored
5 in the memory and executable on the processor.

1 20. (Original) The system of claim 19 wherein a first portion of the memory is
2 used as a kernel memory space and wherein a second portion of the memory is used as a
3 user memory space, and wherein the multipath driver is stored in the kernel memory
4 space.

1 21. (Original) The system of claim 14 wherein the multipath driver further
2 comprises:
3 a fixed set of I/O policies including at least one of a function, a procedure, and an
4 object-oriented method operable to perform at least one of I/O operation
5 scheduling, path selection, and I/O operation error analysis.

1 22. (Original) The system of claim 14 wherein the interface configured to
2 communicate with a device policy module includes at least one of a function, a
3 procedure, and an object-oriented method operable to perform at least one of registering a
4 device policy module with the multipath driver and unregistering a device policy module
5 with the multipath driver.

1 23. (Original) The system of claim 14 wherein the multipath driver is further
2 configured to monitor at least one loaded device policy module.

1 24. (Original) The system of claim 14 wherein the multipath driver is further
2 configured to receive at least one of a request to load a device policy module and a
3 request to unload a device policy module.

1 25. (Original) The system of claim 14 wherein the information about at least one
2 storage device includes at least one device attribute and wherein the device discovery
3 module is further configured to transmit the information about at least one storage device
4 to the multipath driver.

1 26. (Original) The system of claim 25 wherein the at least one device attribute
2 includes at least one of: a number of paths to the device, primary path information,
3 secondary path information, connected path information, disconnected path information,
4 vendor information, an enclosure serial number, and an LUN serial number, an array
5 type.

1 27. (Original) The system of claim 14 wherein the storage device discovery
2 module is further configured to transmit the information about at least one storage device
3 to the multipath driver.

1 28. (Original) The system of claim 14 wherein the storage device discovery
2 module is further configured to receive at least one of a request to load a device policy
3 module and a request to unload a device policy module.

1 29. (Original) A computer readable medium comprising program instructions
2 executable on a processor, the computer readable medium being at least one of an
3 electronic storage medium, a magnetic storage medium, an optical storage medium, and a
4 communications medium conveying signals encoding the instructions, wherein the
5 program instructions are operable to implement each of:

6 receiving a request to load a device policy module into a memory, wherein the
7 device policy module is for use by a device driver, and wherein the device
8 policy module includes at least one of a function, a procedure, and an
9 object-oriented method operable to perform at least one of input/output
10 (I/O) operation scheduling, path selection, and I/O operation error
11 analysis;
12 loading the device policy module into the memory; and
13 registering the device policy module with the device driver.

1 30. (Original) The computer readable medium of claim 29 wherein the request to
2 load a device policy module into a memory is received from at least one of a user
3 application and a device discovery application.

1 31. (Original) The computer readable medium of claim 29 wherein a portion of
2 the memory comprises a kernel memory space, and wherein the program instructions
3 operable to implement the loading the device policy module into the memory further
4 comprise program instructions operable to implement:

5 loading the device policy module into the kernel memory space.

1 32. (Original) The computer readable medium of claim 29 wherein the program
2 instructions operable to implement the registering the device policy module with the
3 device driver further comprise program instructions operable to implement:

4 calling at least one of a function, a procedure, and an object-oriented method
5 associated with the device driver.

1 33. (Original) The computer readable medium of claim 29 further comprising
2 program instructions operable to implement:

3 determining whether the device policy module is currently present in the memory.

1 34. (Original) The computer readable medium of claim 29 wherein the at least
2 one of a function, a procedure, and an object-oriented method of the device policy
3 module is specific to a particular storage device.

1 35. (Original) The computer readable medium of claim 29 wherein the at least
2 one of a function, a procedure, and an object-oriented method operable to perform at least
3 one of I/O operation scheduling, path selection, and I/O operation error analysis
4 comprises program instructions operable to perform at least one of:

5 selecting one of a plurality of communication pathways to at least one storage
6 device;

7 selecting one or more sub-devices of the at least one storage device which will be
8 affected due to a communication pathway failure;

9 selecting an alternate communication pathway in case of a failure of one of the
10 plurality of communication pathways;

11 changing a current communications pathway from a first one of the plurality of
12 communication pathways to a second one of the plurality of
13 communication pathways;
14 responding to SCSI reservation/release requests; and
15 selectively transmitting I/O operations along at least two of the plurality of
16 communication pathways to the at least one storage device.

1 36. (Original) The computer readable medium of claim 29 further comprising
2 program instructions operable to implement:
3 monitoring operation of the device policy module.

37-40. (Cancelled)